Event-By-Event Physics Related to the Chiral Order Parameter and deconfinement phase transition

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Abstract

The out-of-equilibrium evolution of the chiral order parameter might offer unambigous and clean signals of the expected phase transition in a heavy-ion collision. Especially a first order phase transition could lead to striking correlated event-by-event signals if it proceeds through spinodal deomposition

Time scales for critical thermal fluctuations within an effective chiral model is calculated and compared to typical expansion times for heavy-ion collisions. We find that significant supercooling is possible, and the relevant mechanism for phase conversion might be spinodal decomposition.

Potential signatures of supercooling, such as an increase in the correlation length of the scalar condensate, the formation of Disoriented Chiral Condensates, rapididy fluctuations as well as the recently proposed decay of a Wilson line condensate, are discussed.

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